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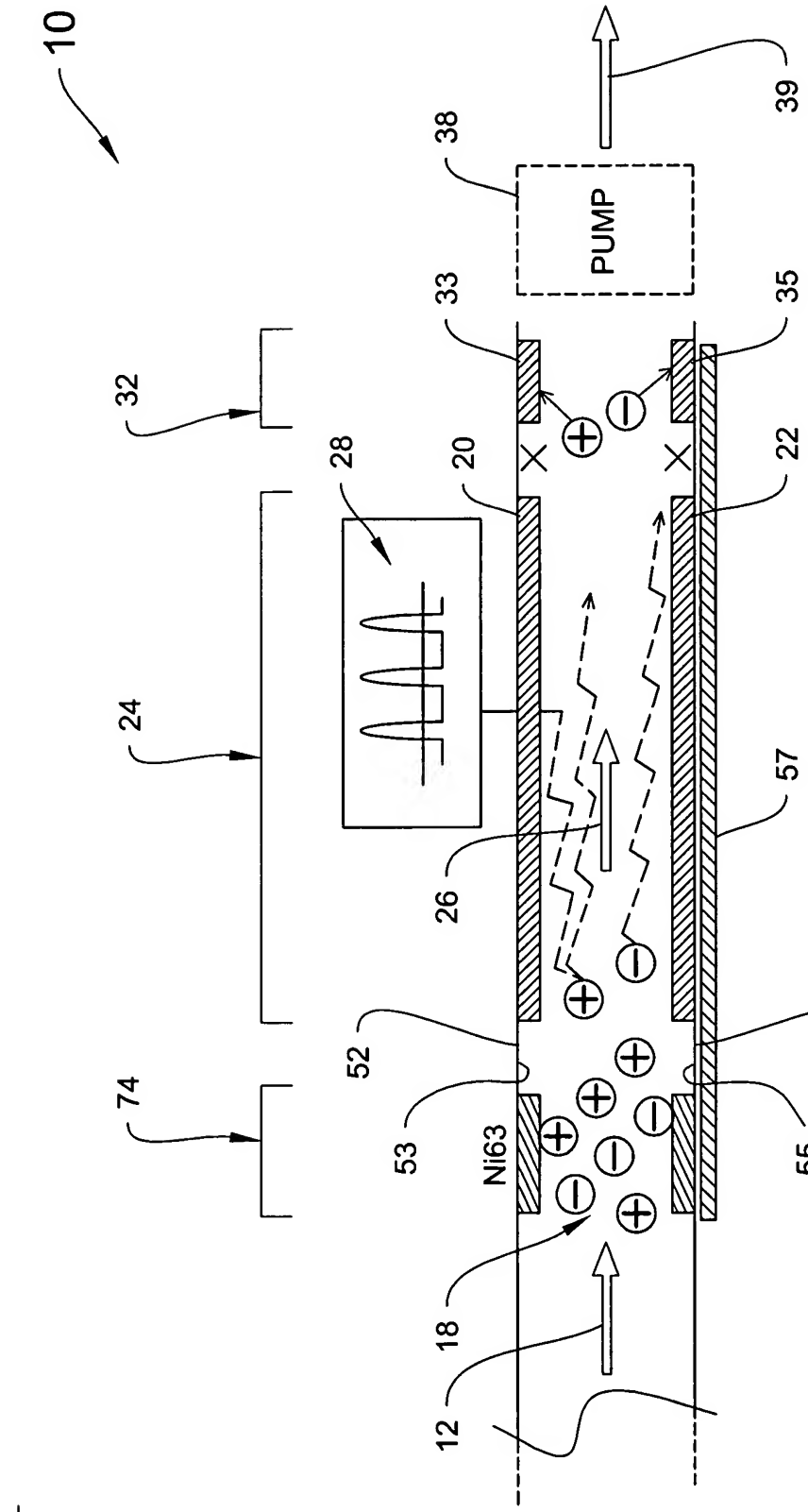

FIG. 1A

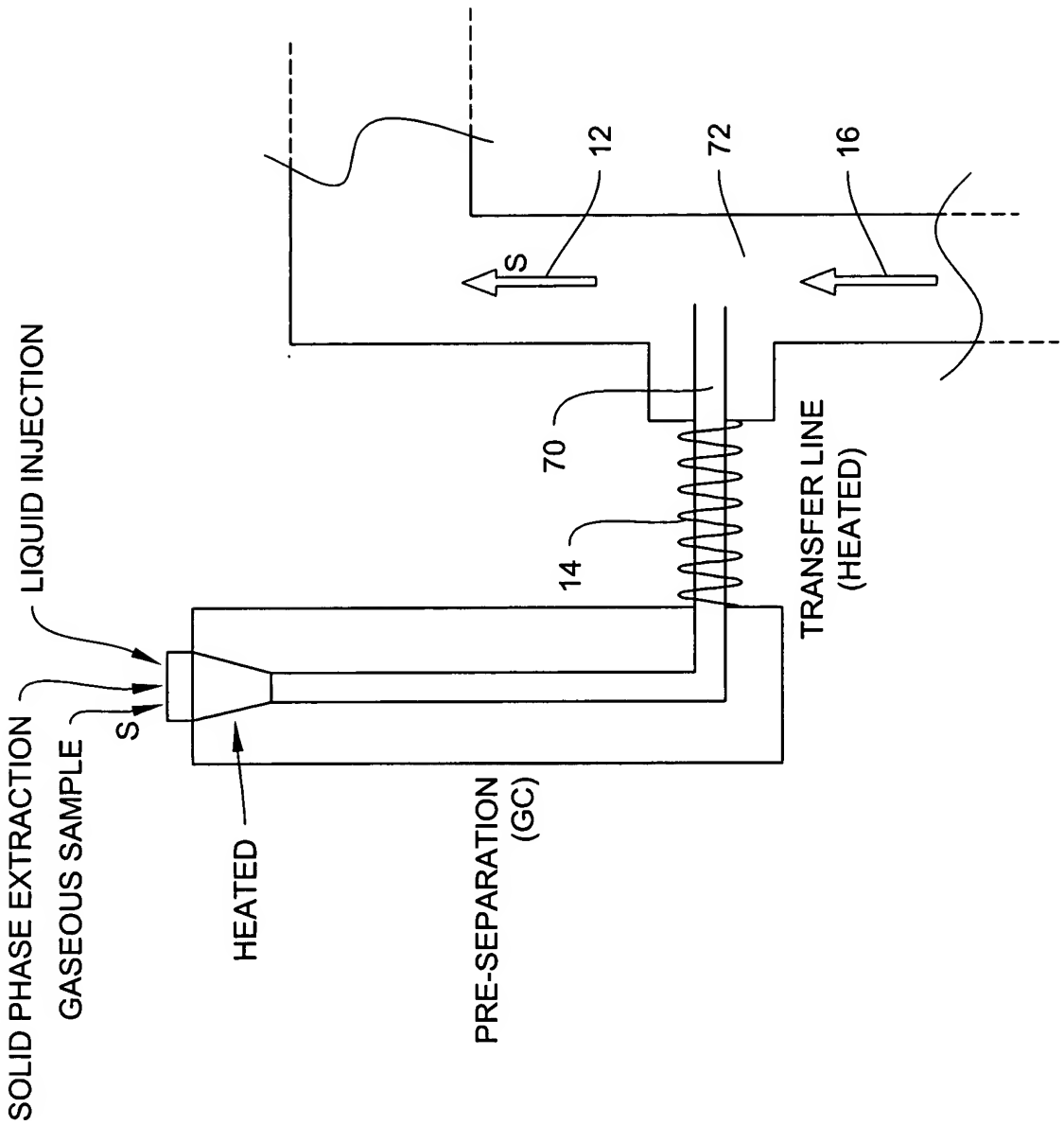
SOLID PHASE EXTRACTION
GASEOUS SAMPLE
LIQUID INJECTION
S
HEATED
PRE-SEPARATION (GC)
14
70
TRANSFER LINE (HEATED)
12
72
16
S

FIG. 1B

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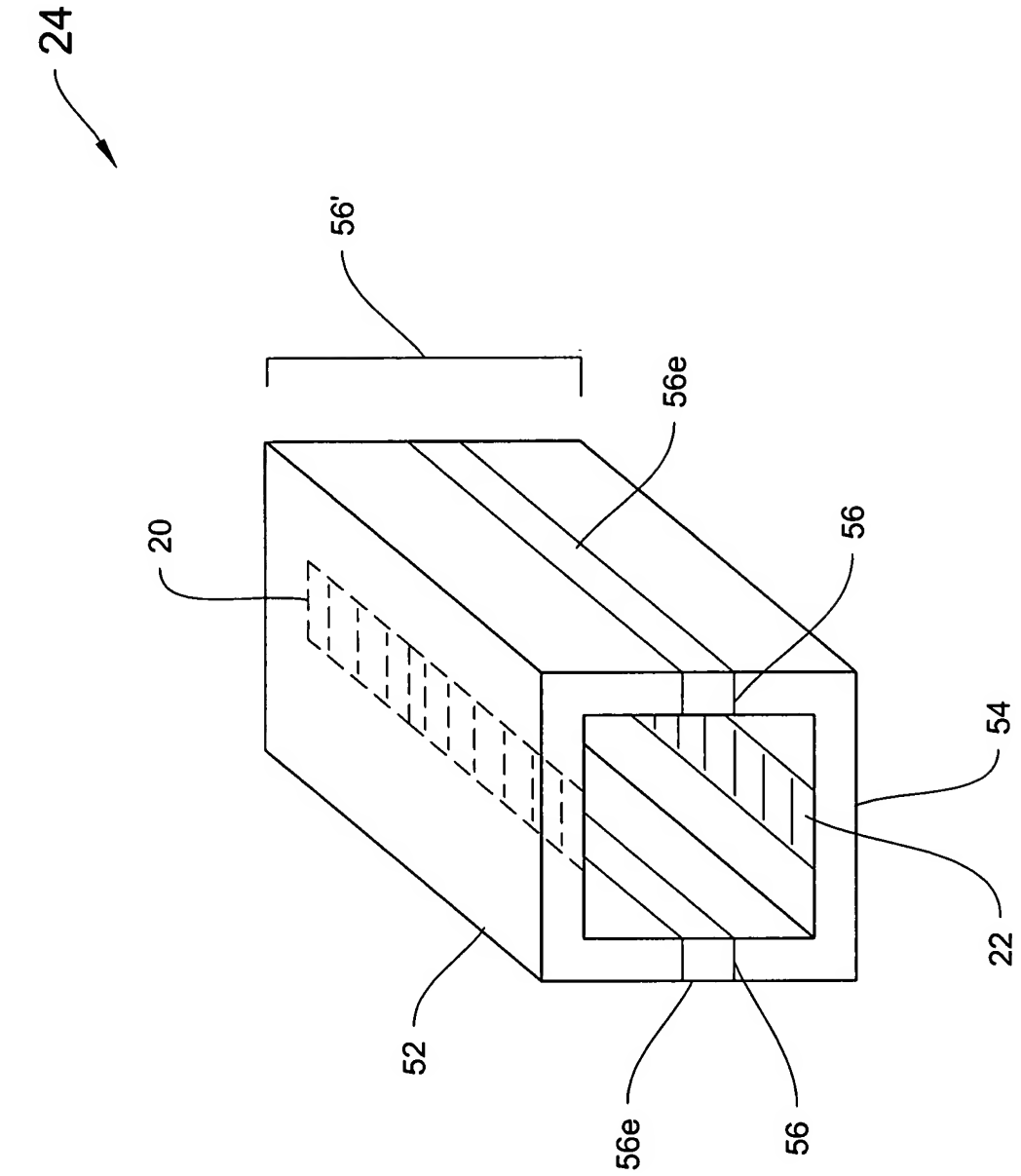

FIG. 1C

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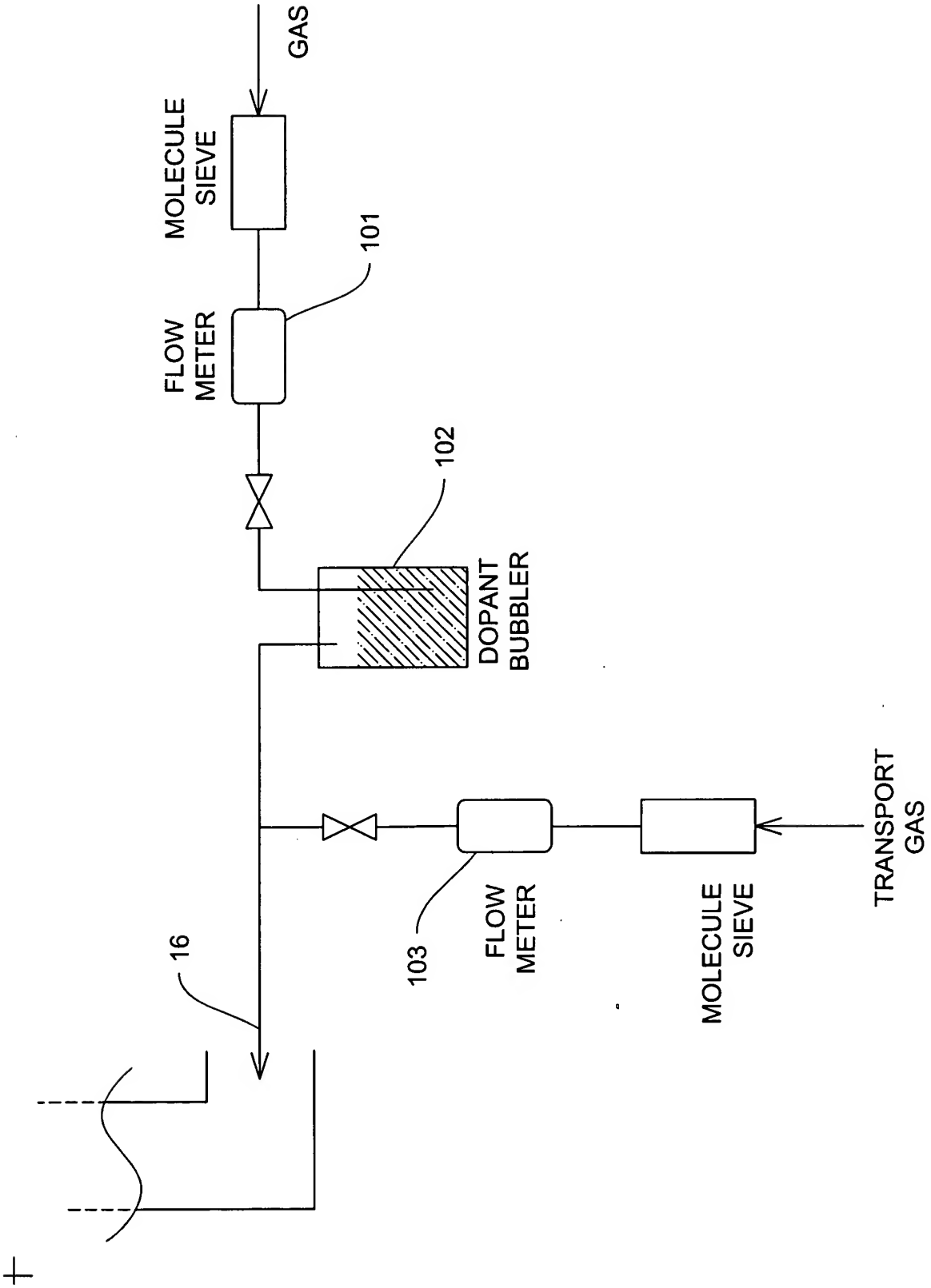

FIG. 1D

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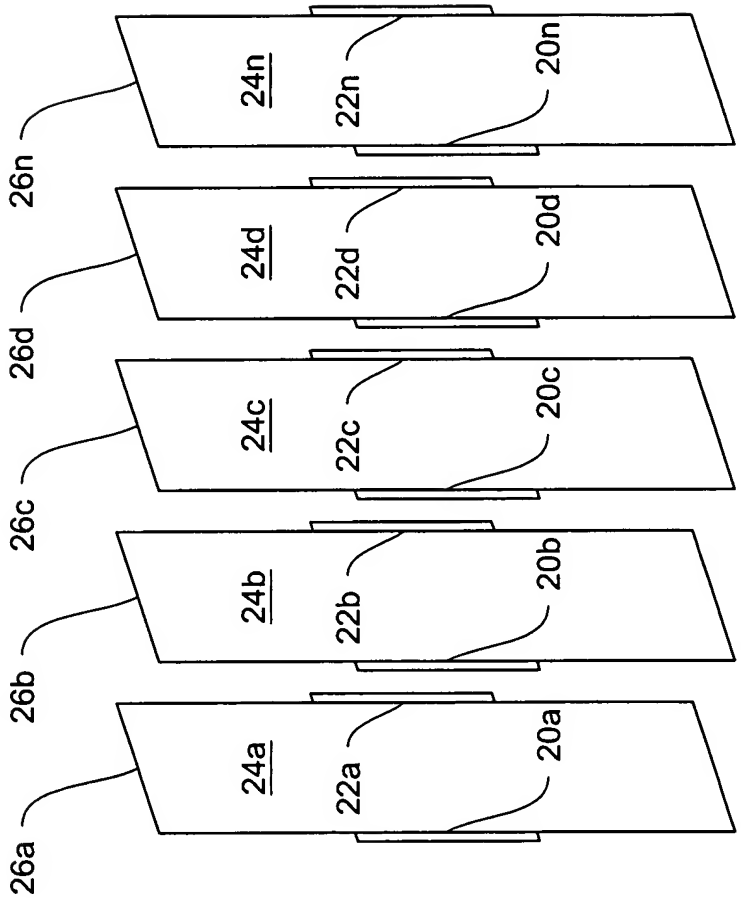

FIG. 1E

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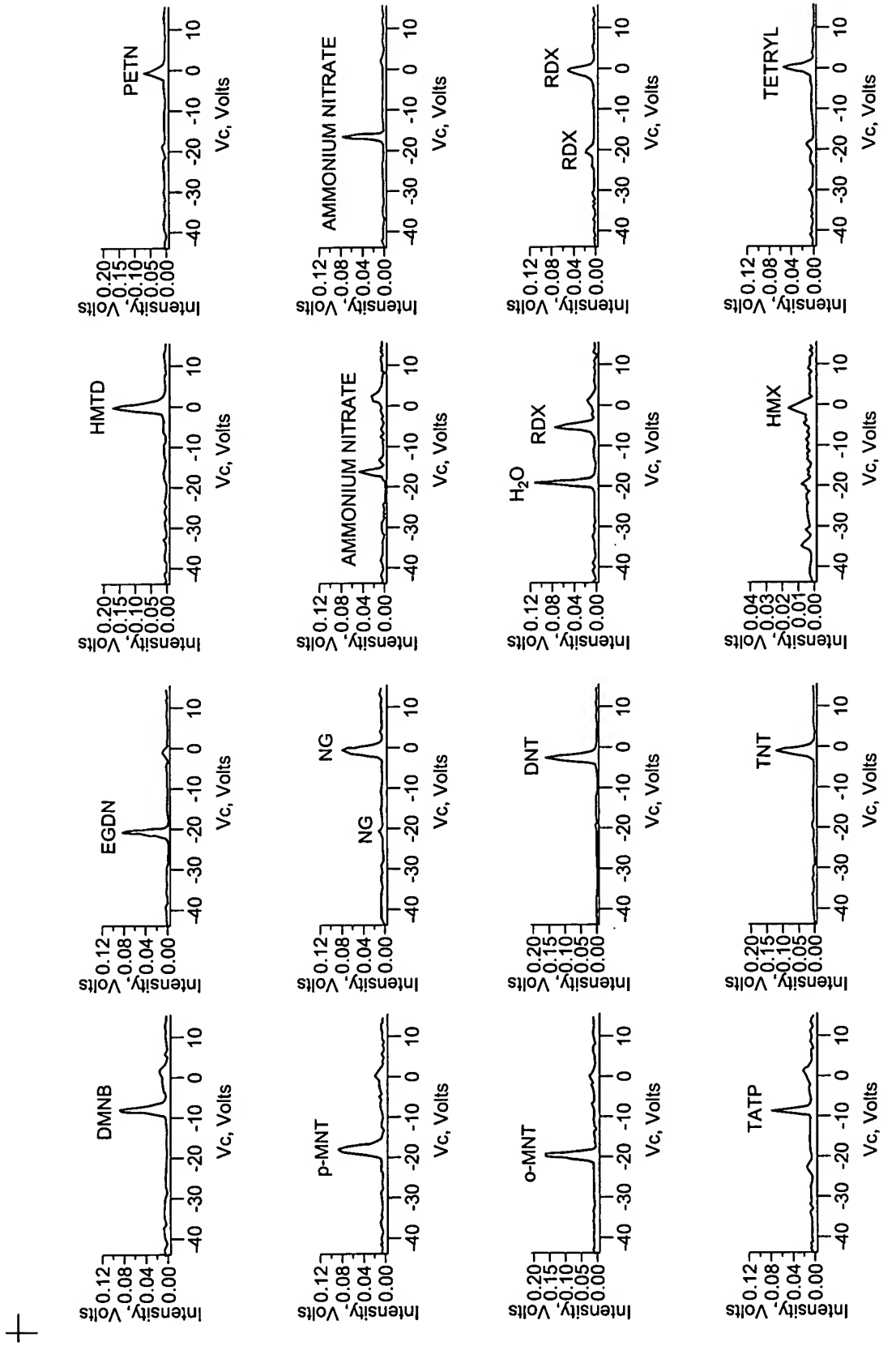

FIG. 2

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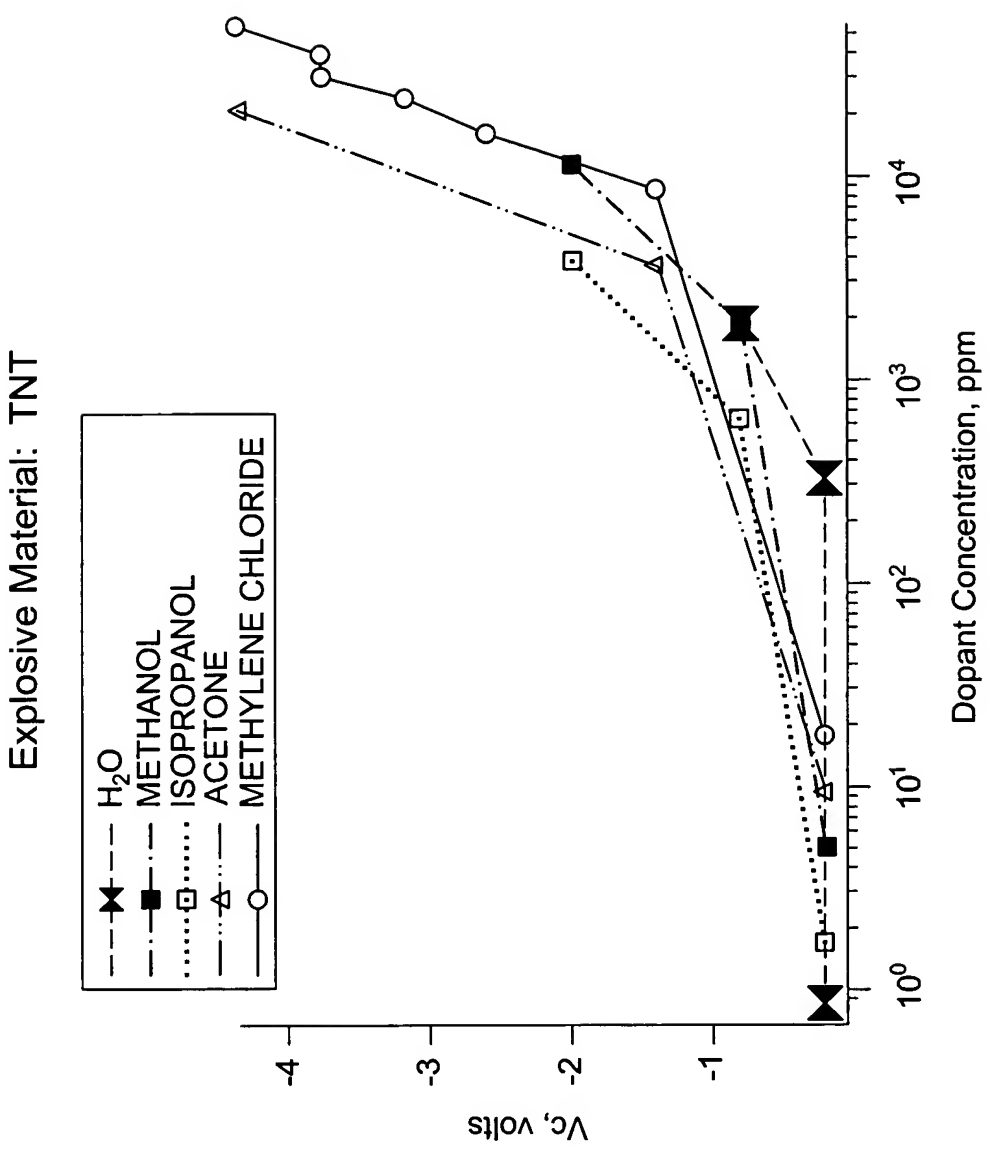

FIG. 3

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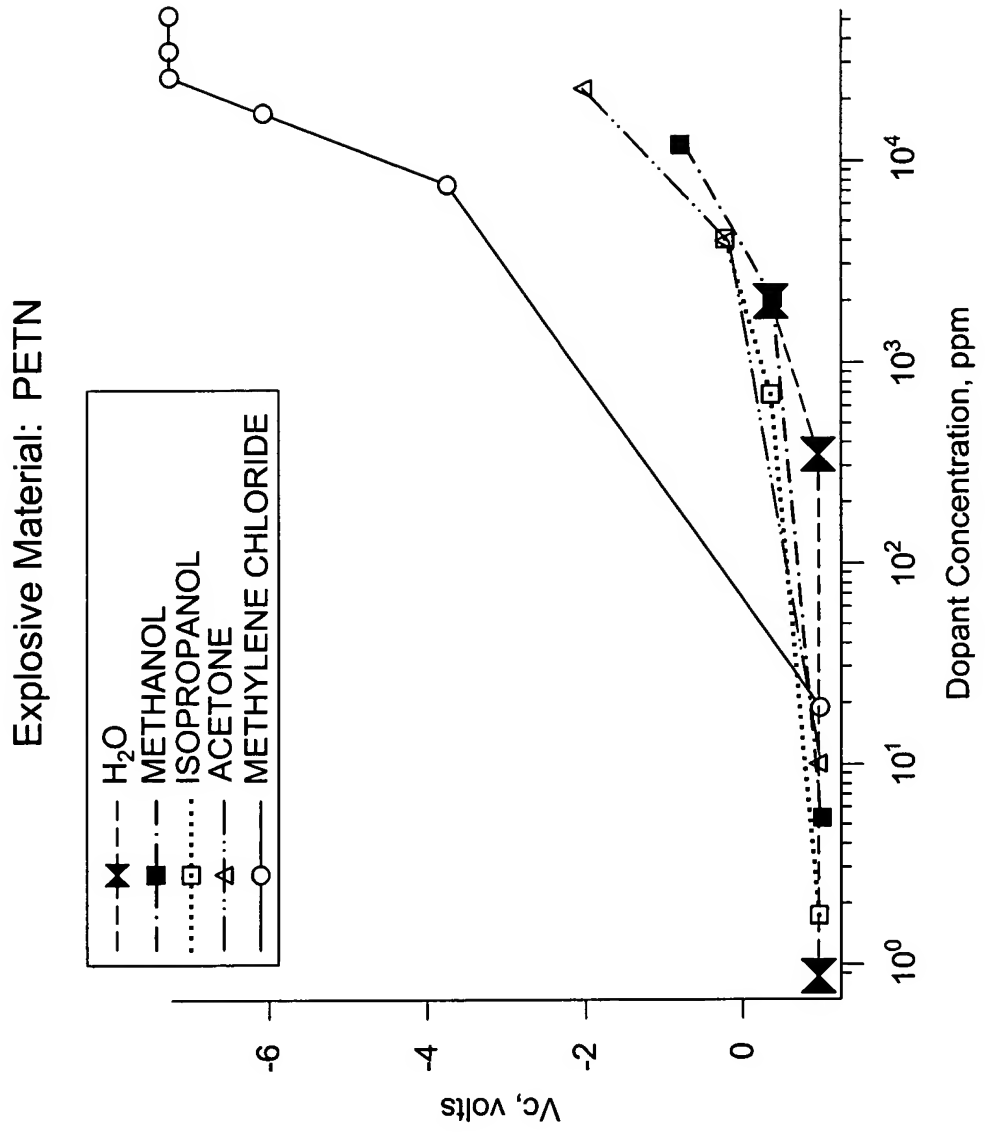

FIG. 4A

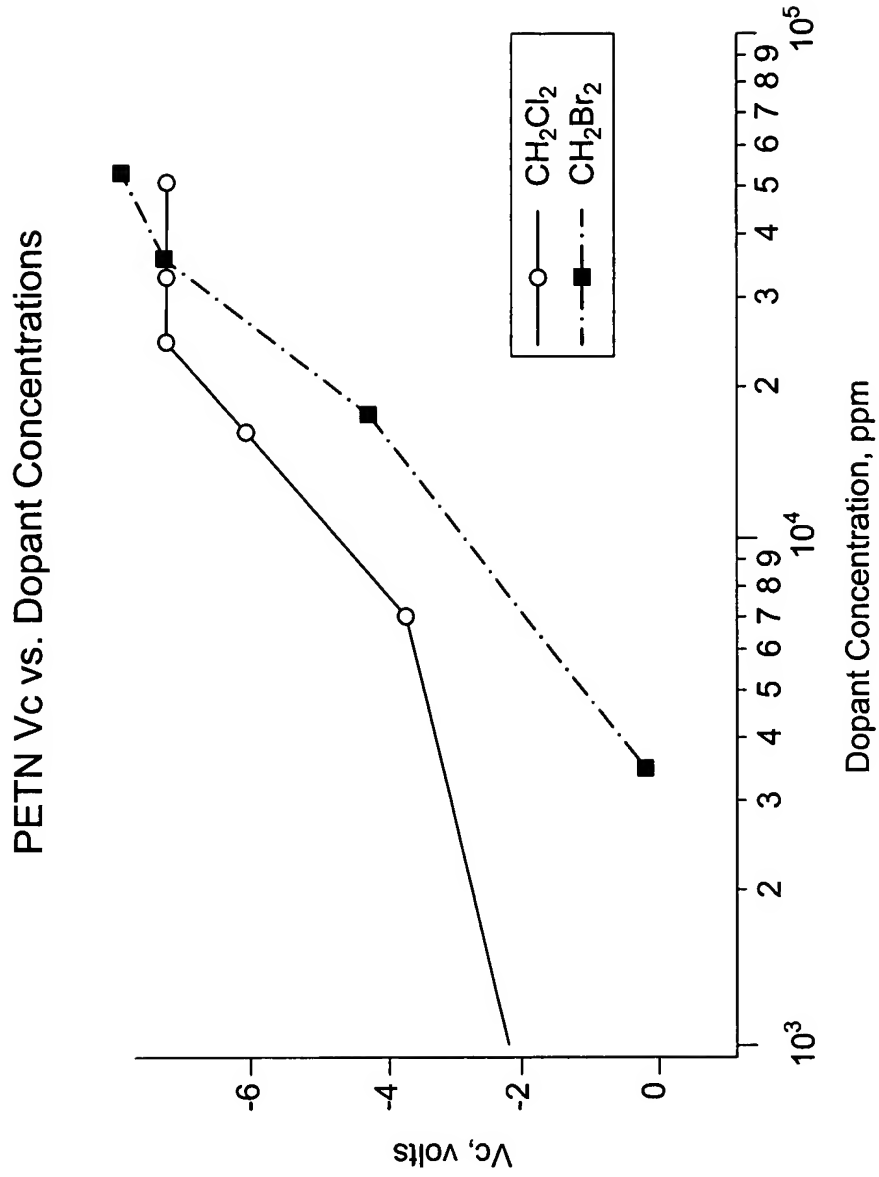
PETN Vc vs. Dopant Concentrations
Vc, volts
0
-2
-4
-6
10^3
2
3
4
5
6
7
8
9
10^4
2
3
4
5
6
7
8
9
10^5
Dopant Concentration, ppm
CH_2Cl_2
CH_2Br_2

FIG. 4B

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NO DOPANT

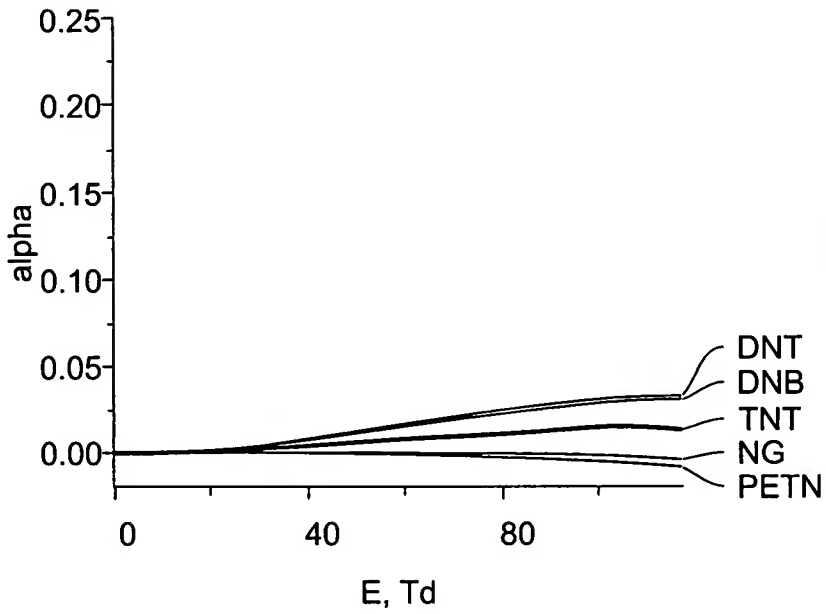

FIG. 5A

DOPANT: CH_2Cl_2

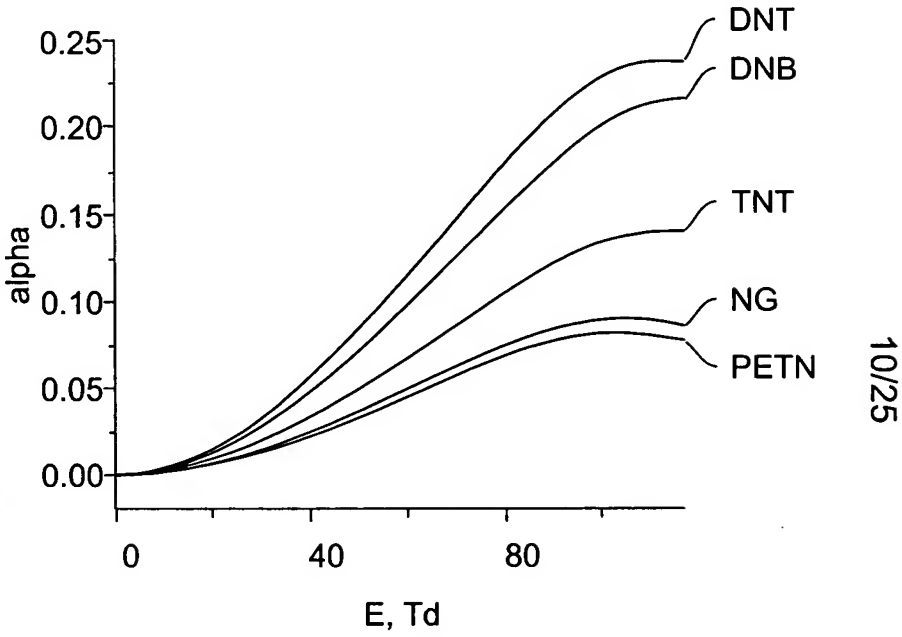

FIG. 5B

OIPE JC
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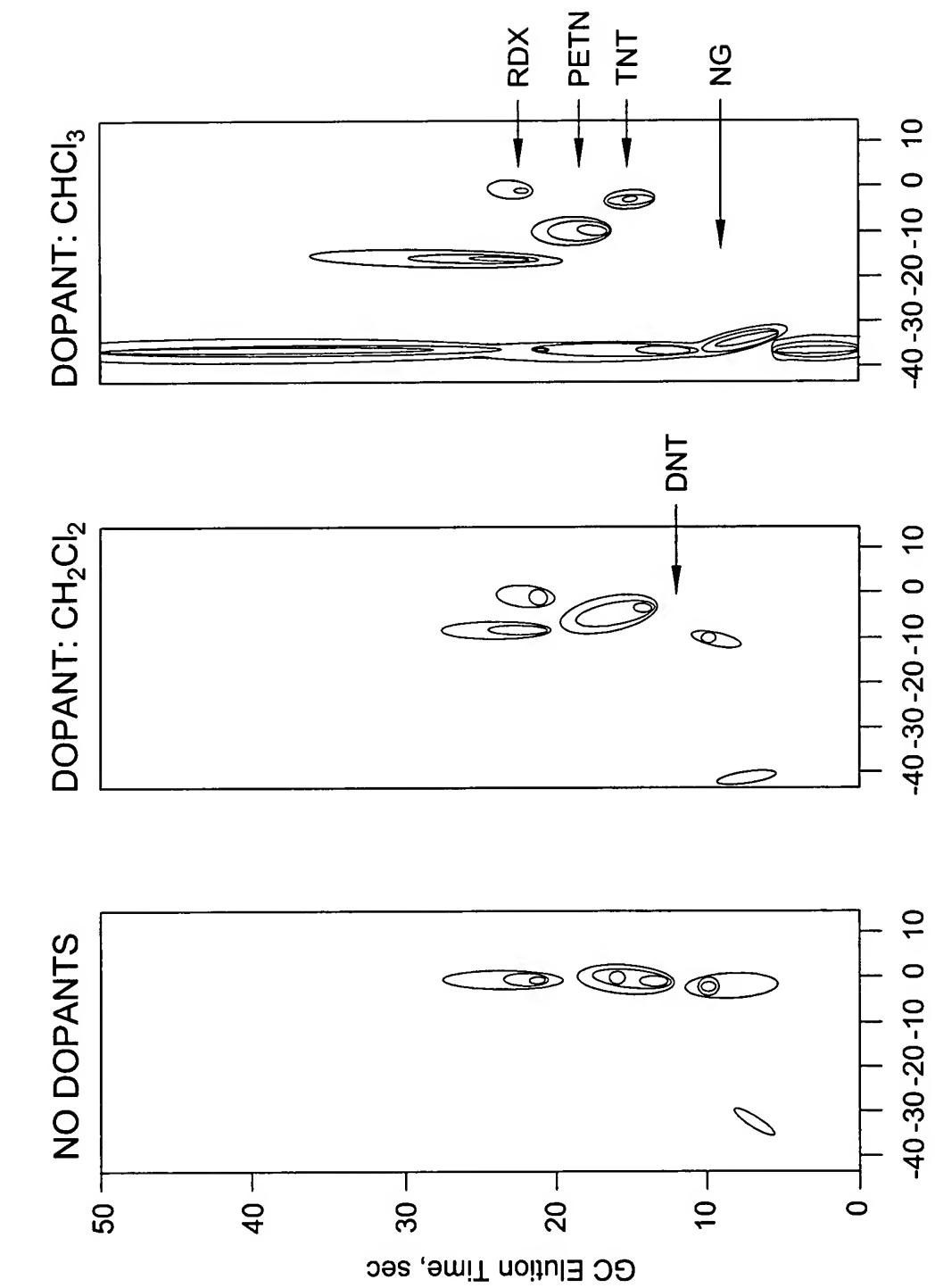

FIG. 6A

FIG. 6B

FIG. 6C

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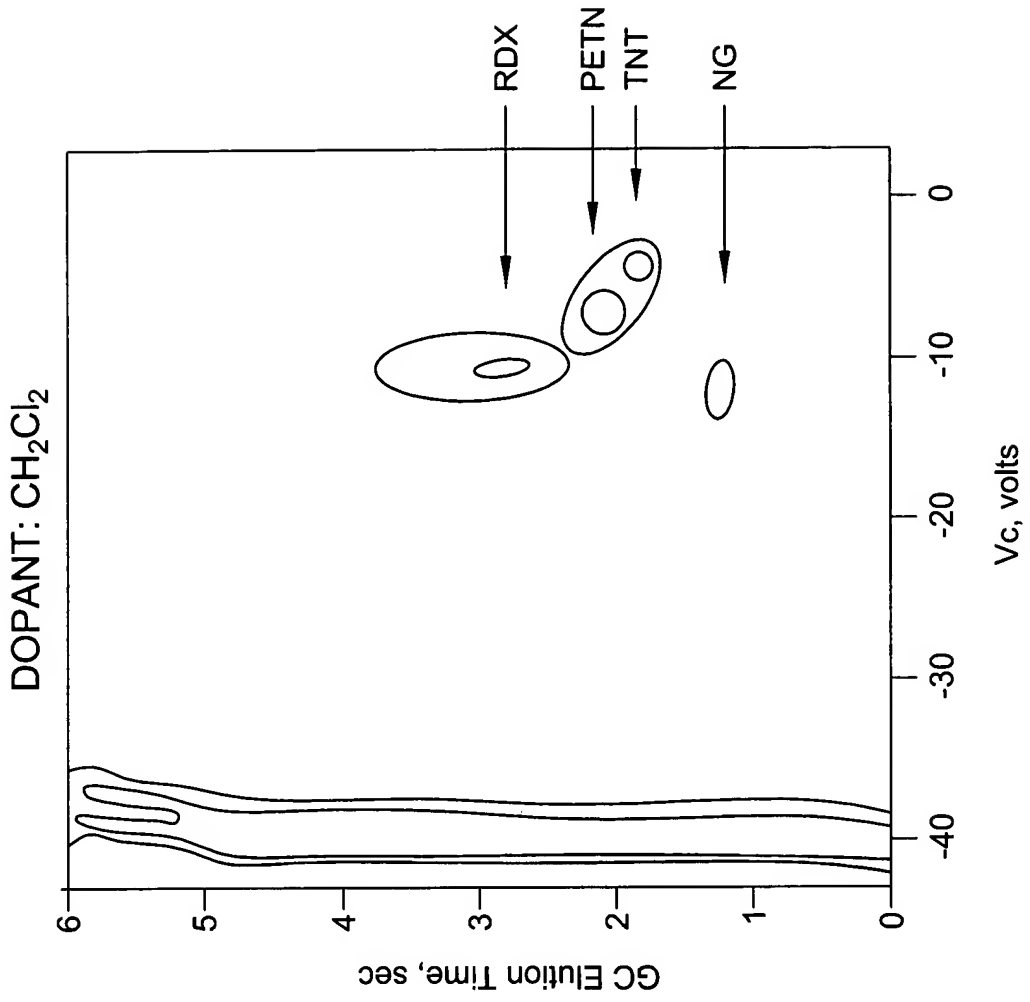

Fig. 7

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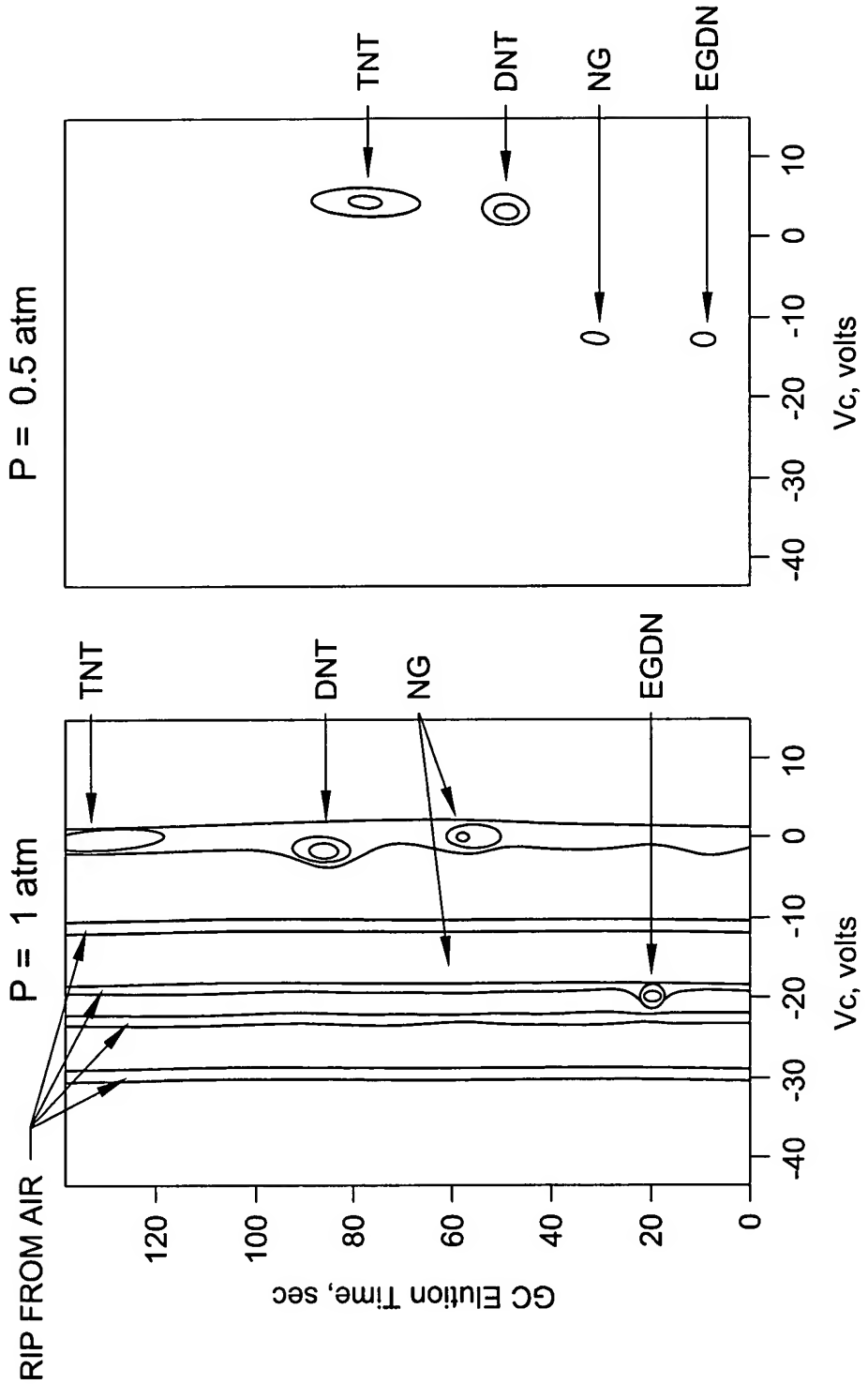

Fig. 8A

Fig. 8B

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Explosive/ Taggant	No Dopant	CH2Br2, 2%	CH2Cl2, 2.5%	CH3OH,1%	Isopropanol,2%
	V, Negative	V, Negative	V, Negative		Not measured
HMX t=95 sec	Vc=-0.23 Rf 950V, Air, 120 C, 1atm long drag, inlet T 150->190C,Oven T 50->100C, 80C/m->100C/m	Vc=-4.9 Rf 950V, Air, 120 C, 1atm long drag, inlet T 150->190C,Oven T 50->100C, 80C/m->100C/m	Vc=-6.1 Rf 950V, Air, 120 C, 1atm long drag, inlet T 150->190C,Oven T 50->100C, 80C/m->100C/m	GC temperature was low, HMX did not move.	
	V, Negative	Not measured	V, Negative	V, Negative	Not measured
Tetryl t=116 sec t=160 sec	Vc=-0.23 Rf 950V, Air, 120 C, 1atm inlet T 150,Oven T 50, 80C/min split 5:1, f=8 cc/min unless specifically noted, other molecules are under same GC conditions		Two peaks Vc=-1.99, -6.68, Rf 950V, Air, 120 C, 1atm	Vc=-0.82 Rf 950V, Air, 120 C, 1atm	
	V, Negative	V, Negative	V, Negative	V, Negative	V, Negative
PETN t=104 sec	Vc=-0.23 Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-7.9 Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml long drag	Vc=-5.51 Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-1.5 Rf 950V, Air, 120 C, 1atm, mix6x10 GC column flow was low	Vc=-5.51 Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml

Fig. 9 (part 1)

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OIPE

Explosive/ Taggant	No Dopant	CH2Br2, 2%	CH2Cl2, 2.5%	CH3OH,1%	Isopropanol,2%
	V, Negative V, Positive	V, Negative	V, Negative V, Positive	V, Negative	V, Negative
RDX t=37 sec(+) t=72 sec(-)	Vc=-0.3, --negative Vc=-4.92, --positive Rf 950V, Air, 120 C, 1atm, mix6x10 Pos and neg are at different retention time, break down effect	Vc=-9, Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml	Vc=-8.43, --negative Vc=-6.68, --positive Rf 950V, Air, 120 C, 1atm, mix6x10 Pos and neg are at different retention time, break down effect	Vc=-2.58, Rf 950V, Air, 120 C, 1atm, mix6x10 no Pos ion shown, MeOH depressed it.	Vc=-6.68, Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml
	V, Negative	V, Negative	V, Negative	V, Negative	V, Negative
NG t=31 sec	Two Peaks Vc=-0.23, -20.7, Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-10, Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml	one peak Vc=-9.6, Rf 950V, Air, 120 C, 1atm, mix6x10	Two peaks Vc=-2.58, -33.7, Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-10, Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml
	V, Negative	X	V, Negative	V, Negative	V, Negative
TNT t=72 sec	Vc=-0.82, Rf 950V, Air, 120 C, 1atm, mix6x10		Vc=-2.58, Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-0.82, Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-10, Rf 1050V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml
	V, Negative	X	V, Negative	V, Negative	V, Negative
EGDN t=10 sec	Vc=-20, Rf 950V, Air, 120 C, 1atm, mix6x10		Vc=-34, Rf 950V, Air, 120 C, 1atm, 2 uL, 0.1 mg/ml peak too close to MeCl2 (-36 V)	Vc=-33.7, Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-30, Rf 850V, N2, 120 C, 1atm, 1 uL, 0.1 mg/ml peak too close to Isopropanol (-32 V)
	V, Negative	X	X	V, Negative	V, Negative
DNT t=48 sec	Vc=-1.7 Rf 950V, Air, 120 C, 1atm, mix6x10	no peaks	no peaks	Vc=-2 Rf 950V, Air, 120 C, 1atm, mix6x10	Vc=-16.7 Rf 950V, N2, 120 C, 1atm, weak signal decreased by 20 times

Fig. 9 (part 2)

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Explosive/ Taggant	No Dopant	CH2Br2, 2%	CH2Cl2, 2.5%	CH3OH,1%	Isopropanol,2%
	V, Positive	Not measured	V, Positive	X	Not measured
o-MNT Taggant t=16 sec	Vc=-17.8, Rf 950V, Air, 120 C, 1atm, too close to RIP		Vc=-14.3, Rf 950V, Air, 120 C, 1atm, too close to RIP		
	V, Positive	Not measured	V, Positive	X	Not measured
p-MNT Taggant 19 sec	Vc=-16.7, Rf 950V, Air, 120 C, 1atm, too close to RIP		Vc=-14.9, Rf 950V, Air, 120 C, 1atm, too close to RIP		
	V, Positive	Not measured	V, Positive	X	Not measured
DMNB t=17 sec	Vc=-7.9, Rf 950V, Air, 120 C, 1atm		Vc=-9, Rf 950V, Air, 120 C, 1atm		
	V, Positive	Not measured	V, Positive	V, Positive	X
TATP t=13 sec	Vc=-8.43, Rf 950V, Air, 120 C, 1atm		Vc=-10.8, Rf 950V, Air, 120 C, 1atm	Vc=-5, Rf 950V, Air, 120 C, 1atm	
	V, Positive	Not measured	V, Positive	V, Positive	X
HMTD t=49 sec	Vc=1.5, Rf 950V, Air, 120 C, 0.6atm old sample		Vc=-1.4, Rf 950V, Air, 120 C, 1atm new sample	Vc=-0.82, Rf 950V, Air, 120 C, 1atm old sample	
	V, Negative V, Positive	Not measured	V, Negative V, Positive	Not measured	V, Negative
AN t(+)=3 sec t(-)=6 sec	Vc=-19.6,--negative Vc=-19.6,--positive Rf 950V, air, 120 C, 1atm Pos and neg are at different retention time, break down to NH3 (+) and HNO3(-)		Vc=-41.83, --negative Vc=-24.3, --positive Rf 950V, air, 120 C, 1atm Pos and neg are at different retention time, break down to NH3 (+) and HNO3(-)		Vc=-3.75, Rf 950V, Air, 120 C, 1atm, mix6x10 no Pos ion shown, Isopropanol depressed it.

Fig. 9 (part 3)

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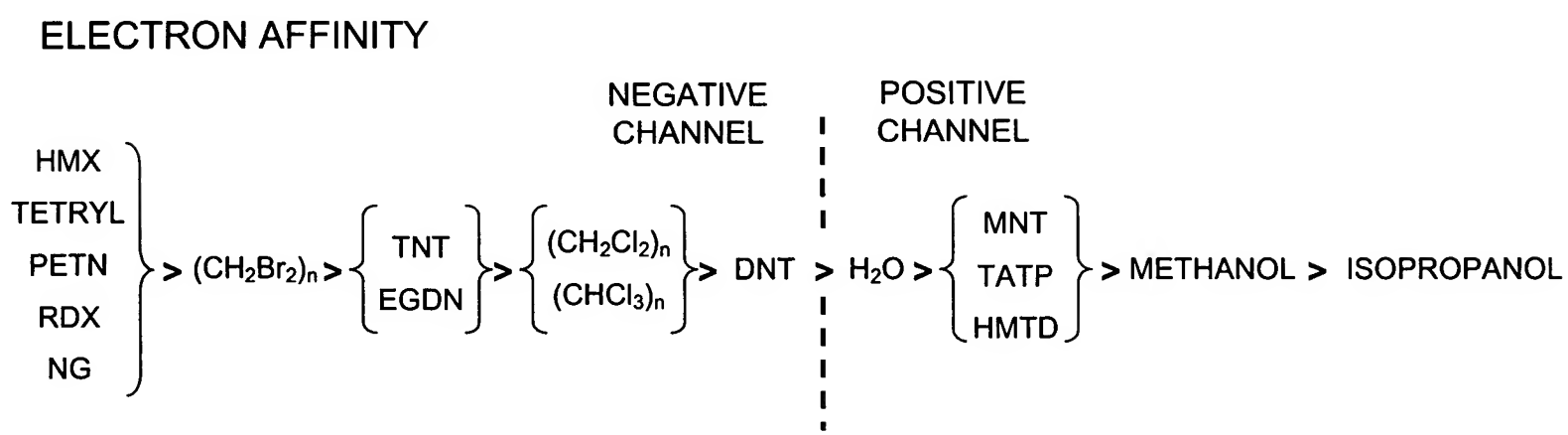

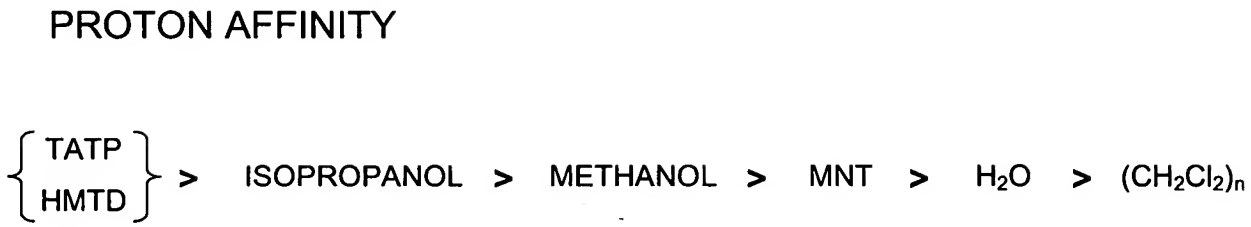

Fig. 10

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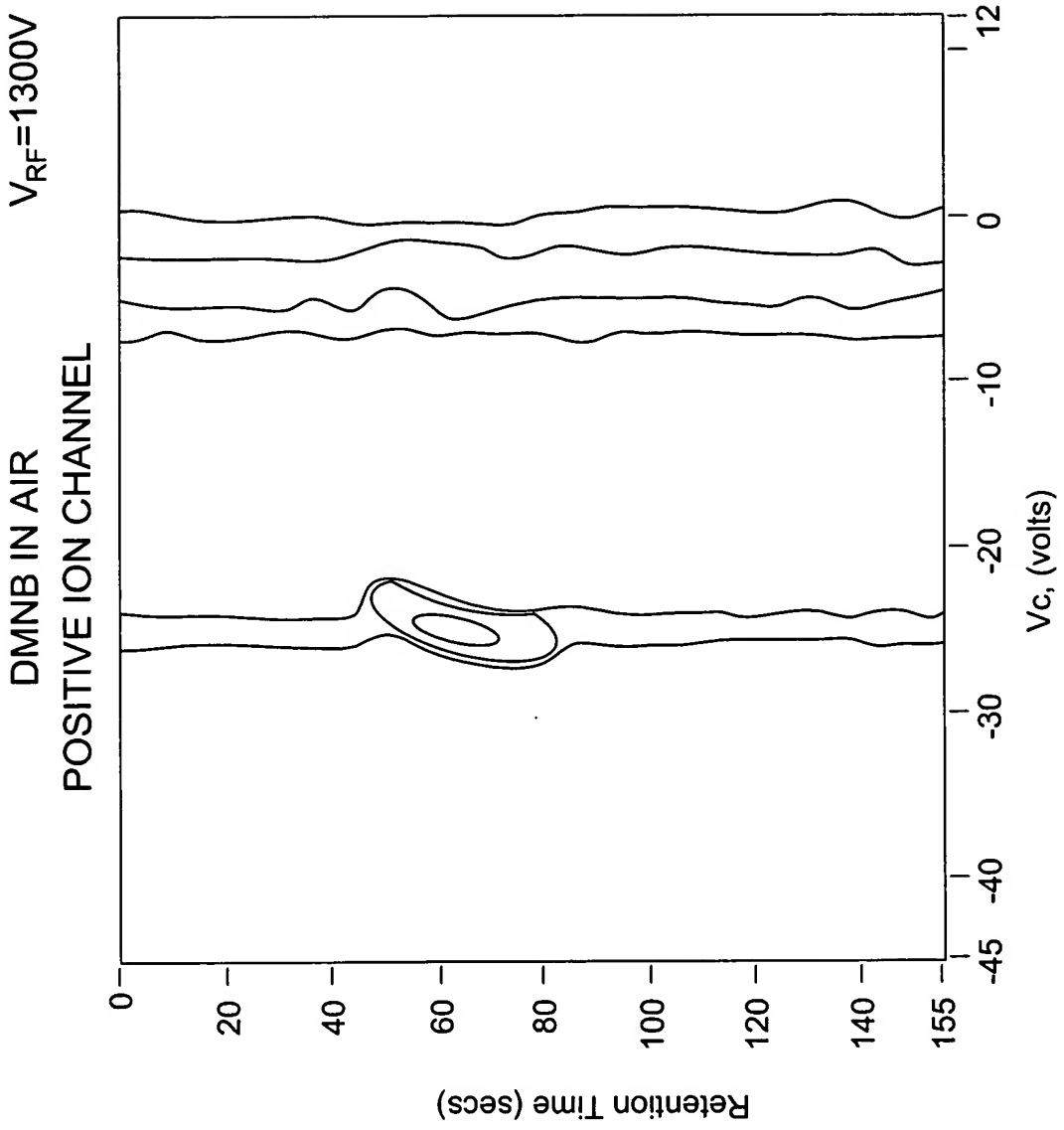

Fig. 11A

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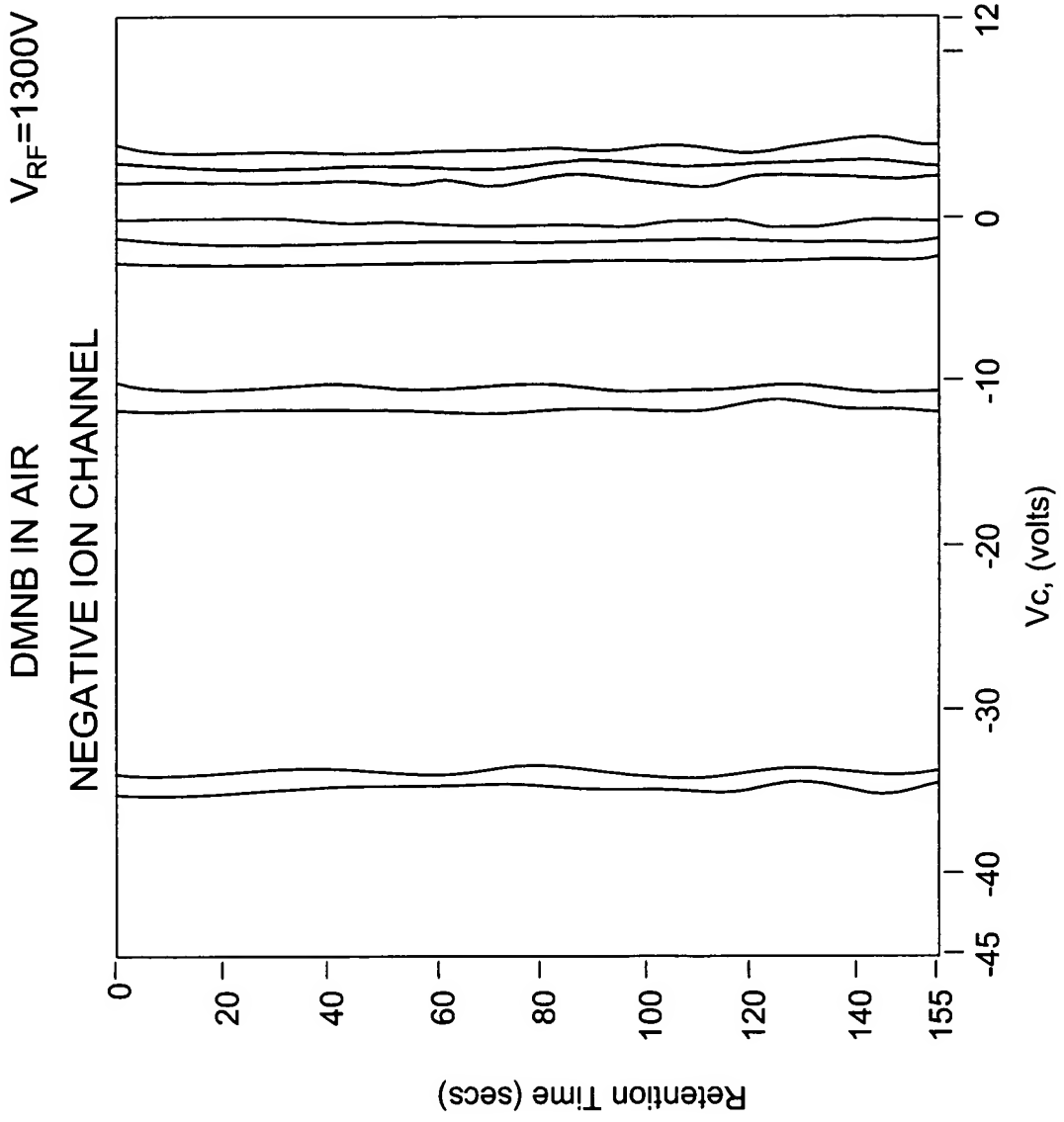

Fig. 11B

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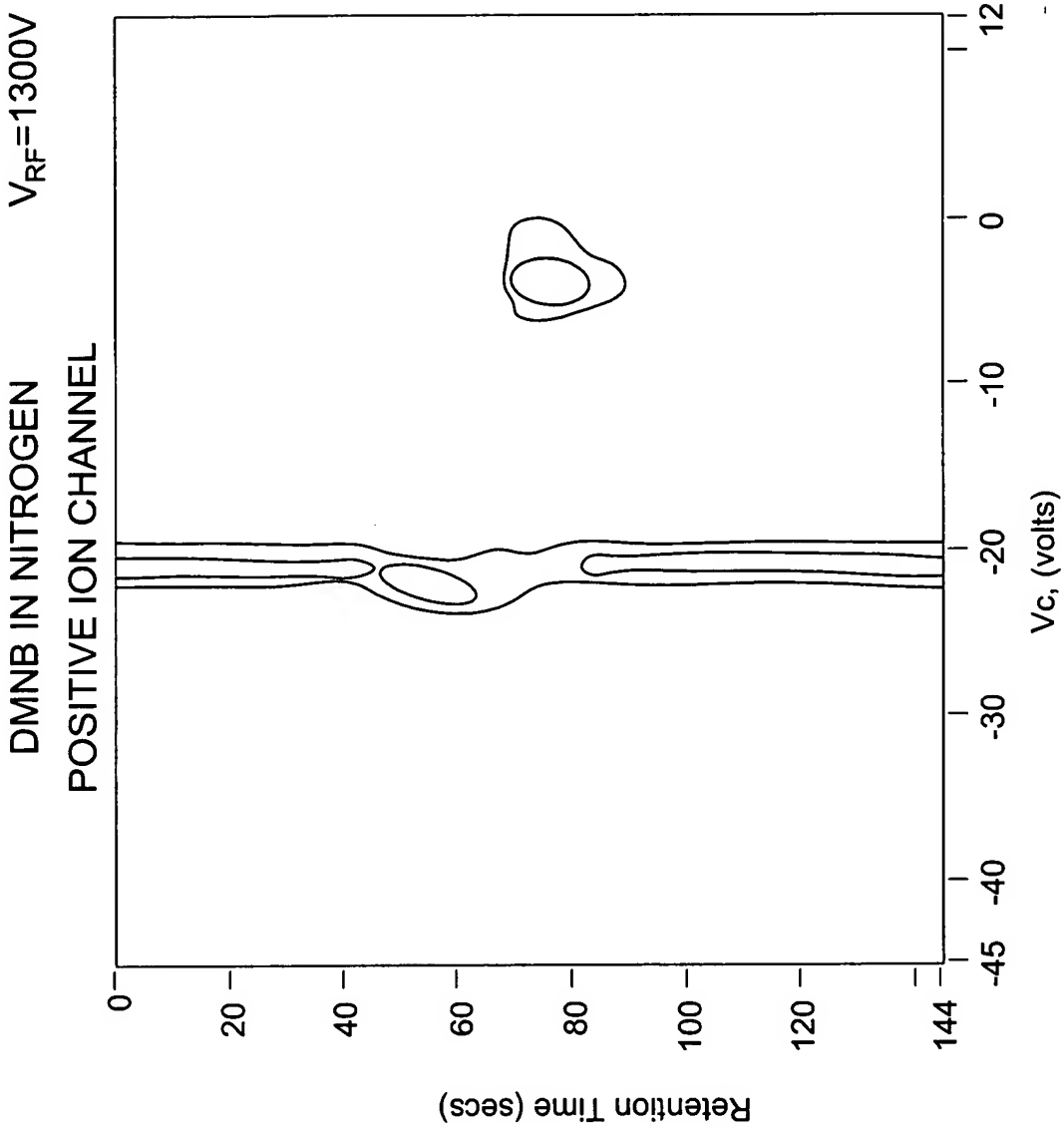

Fig. 12A

OIPE JC
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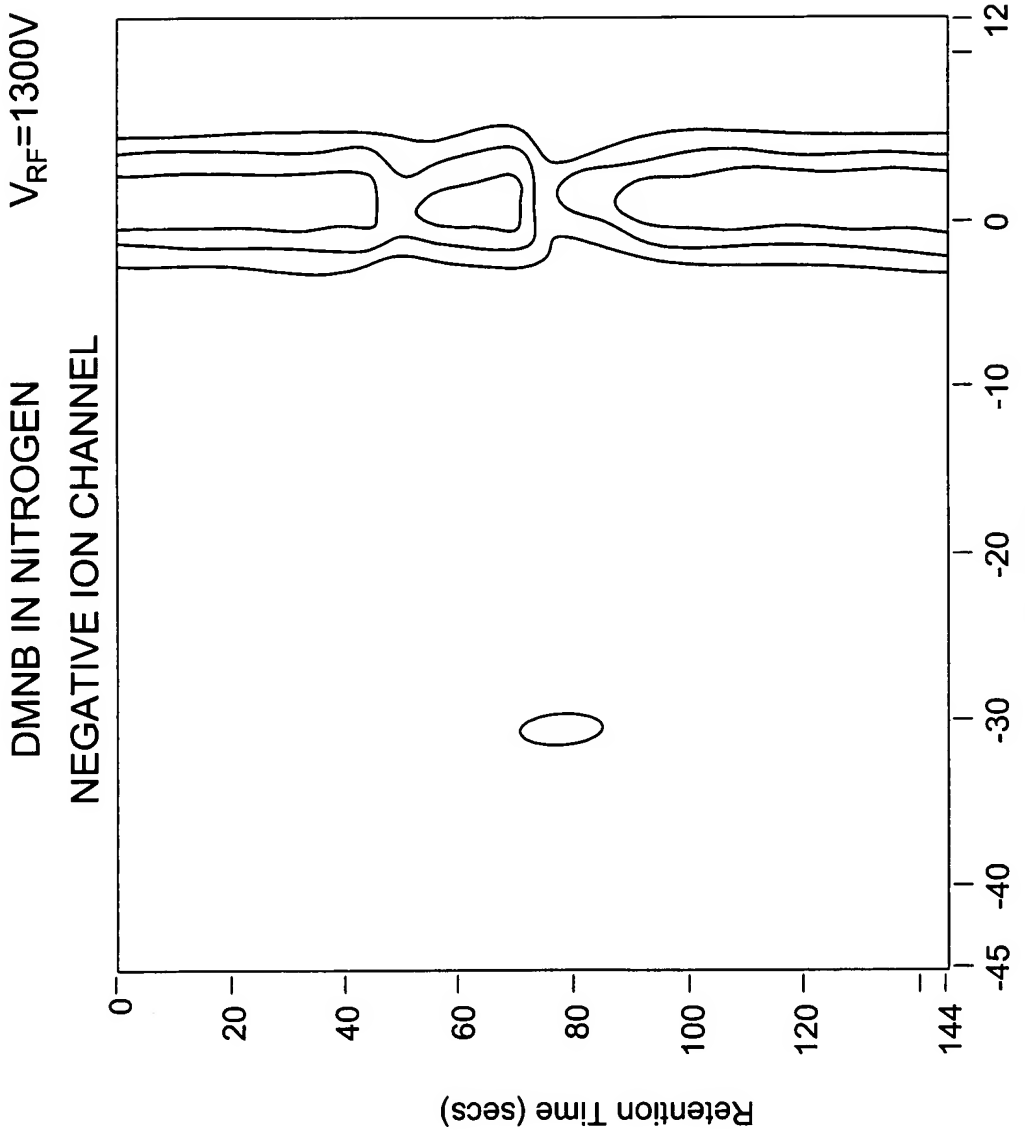

Fig. 12B

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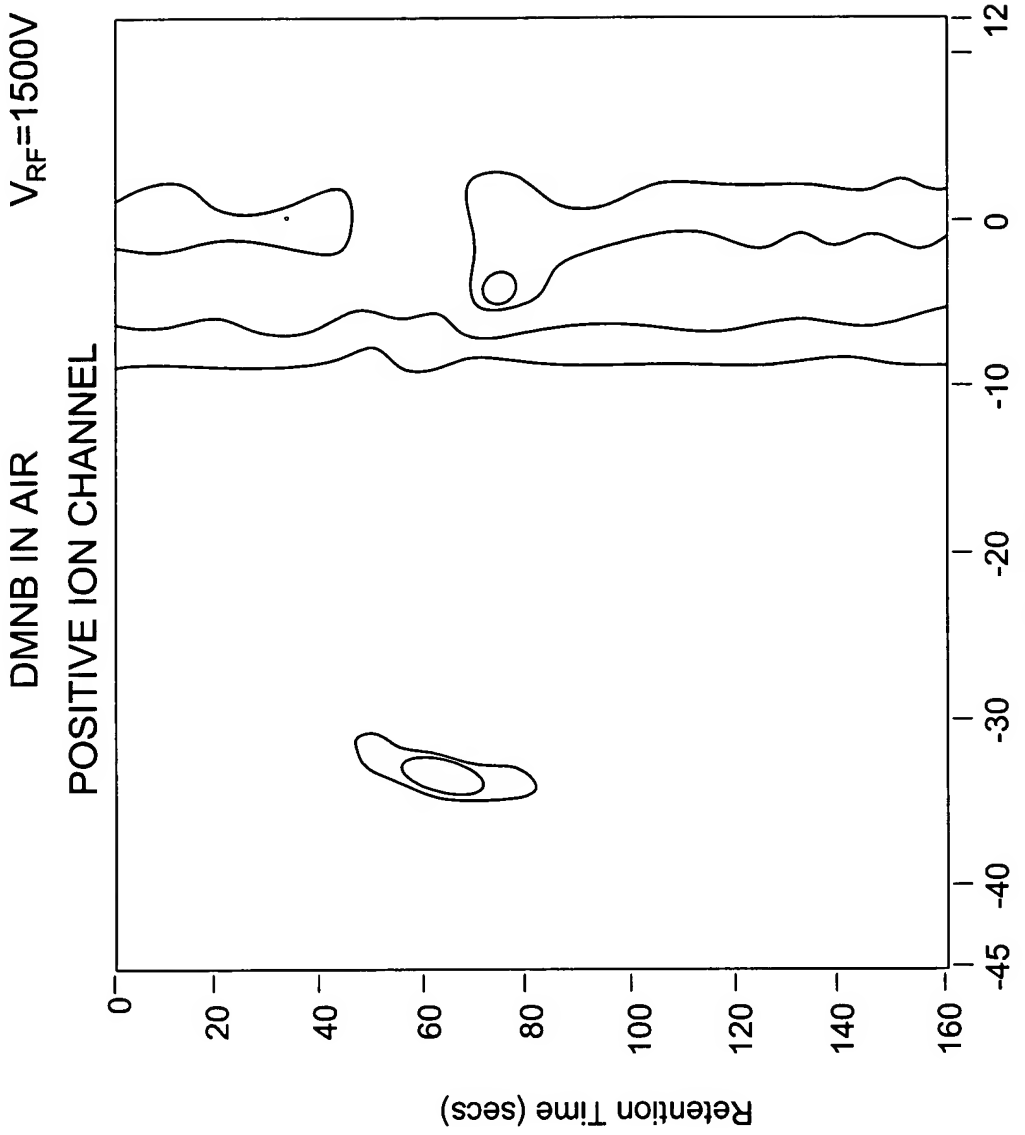

Fig. 13A

OIPE
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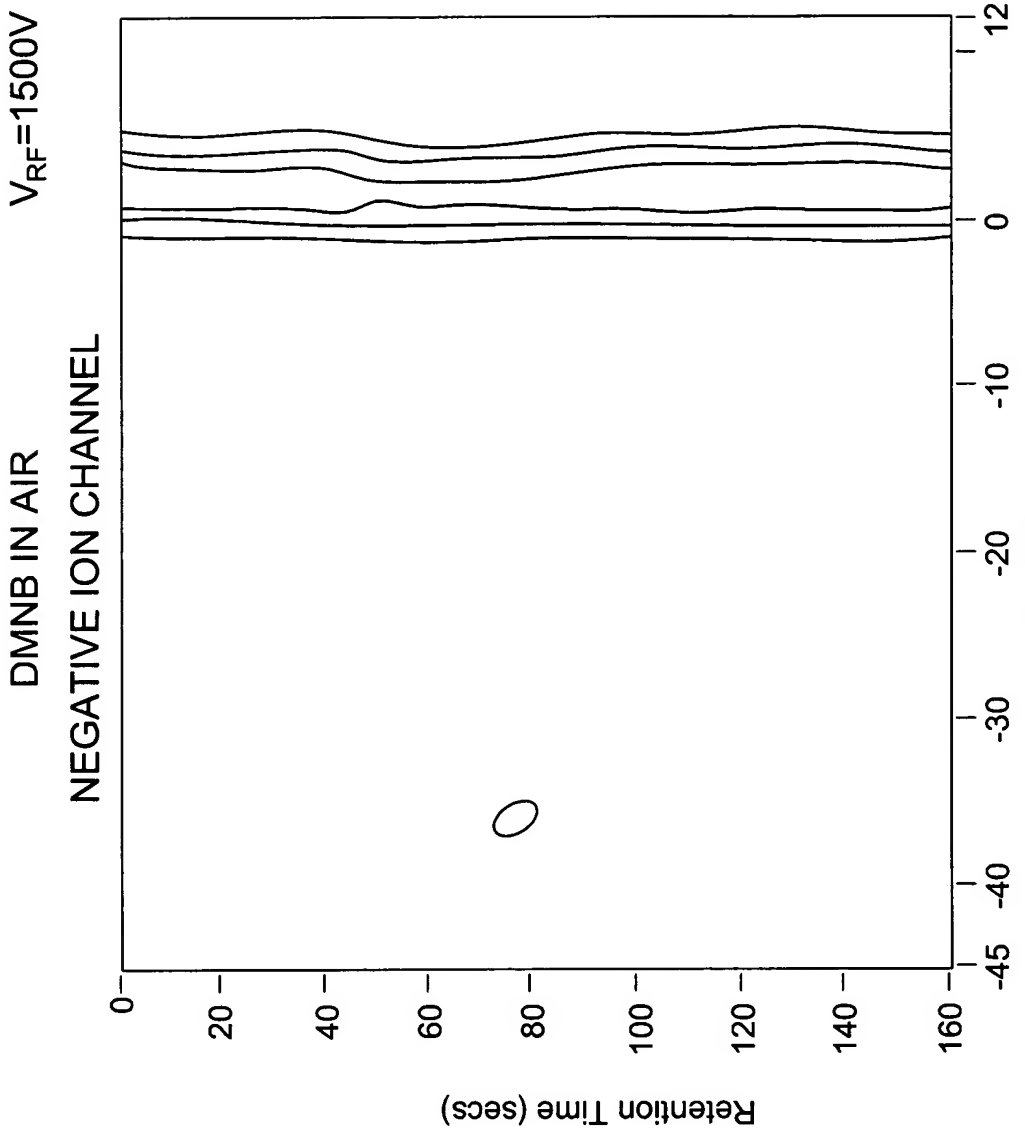

Fig. 13B

OIPE
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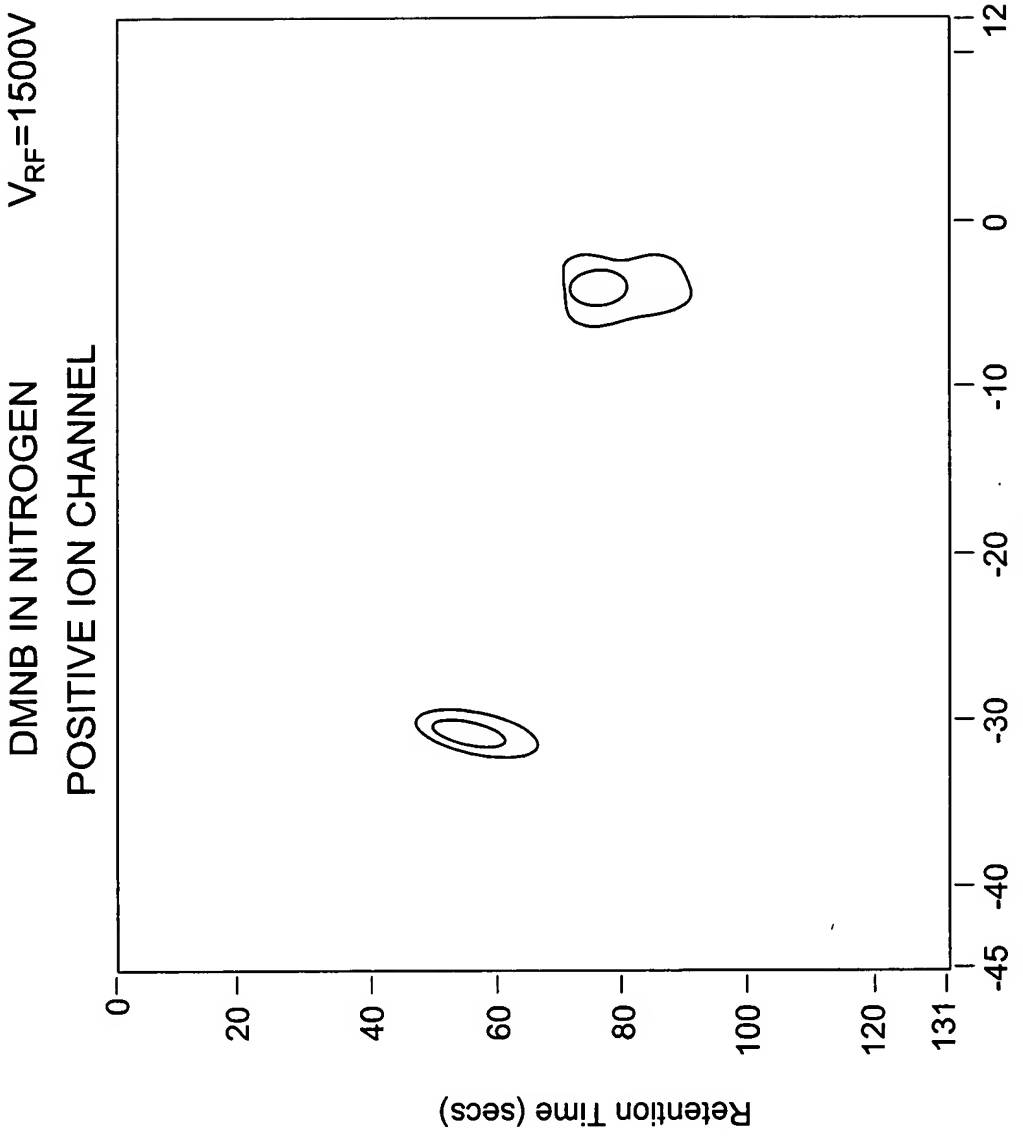

Fig. 14A

OIPE
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PATENT & TRADEMARK OFFICE

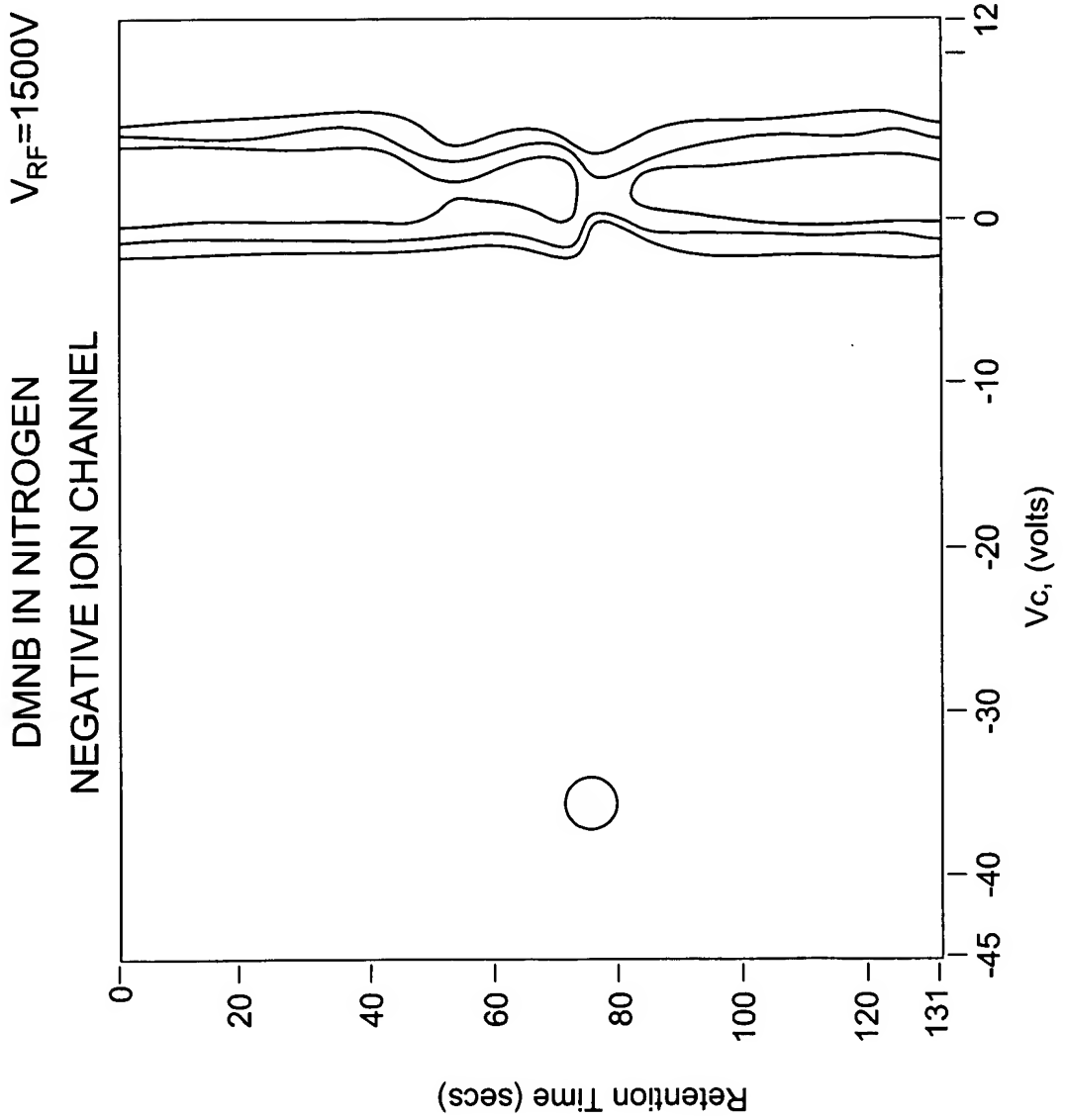

Fig. 14B